

REMARKS

The claimed invention

The present invention is directed to electromechanical devices that comprise substantially planar electroactive ceramic members. These members have grooves or slots formed therein, for example via laser machining. The grooves allow the ceramic member to conform to a curved surface. The slots multiply an electromechanical bending response of a bimorph ceramic member. The grooves or slots may be arranged, for example, in a substantially parallel or a substantially concentric array.

The prior art

Junger is a U.S. patent disclosing an assortment of transducer shapes. The transducers include various fins or projections designed to increase the inertia of the transducer and thereby reduce the resonant frequency (column 2, lines 28-35). Particular reference is made in the Office Action to Fig. 13, which shows a cantilevered bimorph transducer having wedge-shaped protrusions on its top and bottom surfaces.

Dias is a U.S. patent disclosing an annular array sensor. The sensor is produced by machining annular grooves in the convex side of a shell of piezoelectric material. The cuts “are made almost entirely through the shell [12] so that a small amount of material [20] remains between the cut and the concave side [14]” (abstract, referring to the figures of Dias). The shell itself is “shaped like a section sliced from a spherical shell” (column 5, lines 9-10).

Rejections under 35 U.S.C. § 112

Claims 17-21 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. This rejection is respectfully traversed for the reasons set forth below.

Claim 17 recites “a substantially planar ceramic electroactive member having grooves defined on a planar surface of the member and defining ridges therebetween, whereby the grooves are adapted and constructed to reduce transverse strains generated by bending such that the member is capable of bending to conform to a curved surface while maintaining electrical connections between adjacent ridges.” One skilled in the art would recognize these features of the claimed invention in the specification. Specifically, page 6, lines 4-9, of the specification

describe an embodiment of the invention in which grooves are cut into, but not through, an electroactive ceramic. The electroactive ceramic “remains in one continuous piece” (page 6, line 8). An electroactive ceramic exhibits sufficient electrical conductivity that an electric voltage can be applied across it. The application of the electric field causes a mechanical strain in the material, which strain may be exploited in a variety of devices, including sensors and actuators (see abstract). One skilled in the art would recognize that, because the grooved electroactive ceramic is still one continuous piece, it is not necessary to apply electric voltage to each projection (the material between the grooves) to elicit the desired mechanical response. Rather, the voltage may be applied across the ceramic piece as a whole, and the ceramic will conduct the voltage to the projections between the grooves, providing electrical communication between the grooves. This is confirmed by the specification, which, at page 6, lines 27-29, discloses that “the microscopic electromechanical coupling behavior will remain substantially unchanged in the machined ceramic form.”

For at least the foregoing reasons, Applicants submit that claims 17-21 meet the requirements of 35 U.S.C. 112 and request reconsideration and withdrawal of the outstanding rejection.

Rejections under 35 U.S.C. § 103

Claims 22-25 stand rejected under 35 U.S.C. § 103(a) as obvious over Junger in view of Dias. This rejection is respectfully traversed for the reasons set forth below.

Independent claim 22 recites a substantially planar bimorph electroactive ceramic member having slots defined therein to increase its electromechanical bending response. This claim has been amended to clarify that the slots are cuts that extend through the thickness of the member, as can most clearly be seen in Figure 5 of the instant application. Both Junger and Dias describe transducers which do not include such cuts through the thickness of the planar member. For example, Junger discloses a cantilevered bimorph transducer having wedge-shaped protrusions on its top and bottom surfaces (Figure 13). Dias discloses cuts “made almost entirely through the shell [12] so that a small amount of material [20] remains between the cut and the concave side [14]” (abstract, referring to the figures of Dias). Thus, these references fail together to teach a material feature of the claimed invention, and cannot be used to make out a *prima facie* case of obviousness.

For at least these reasons, Applicants submit that the invention of claims 22-25 is not obvious in view of the cited art, and request reconsideration and withdrawal of the outstanding rejection.

A petition for extension of time and a request for continued examination are enclosed herewith. Please charge any fees associated with this filing, or apply any credits, to our Deposit Account No. 03-1721.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Valarie B. Rosen", written over a horizontal line.

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